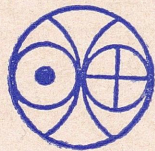
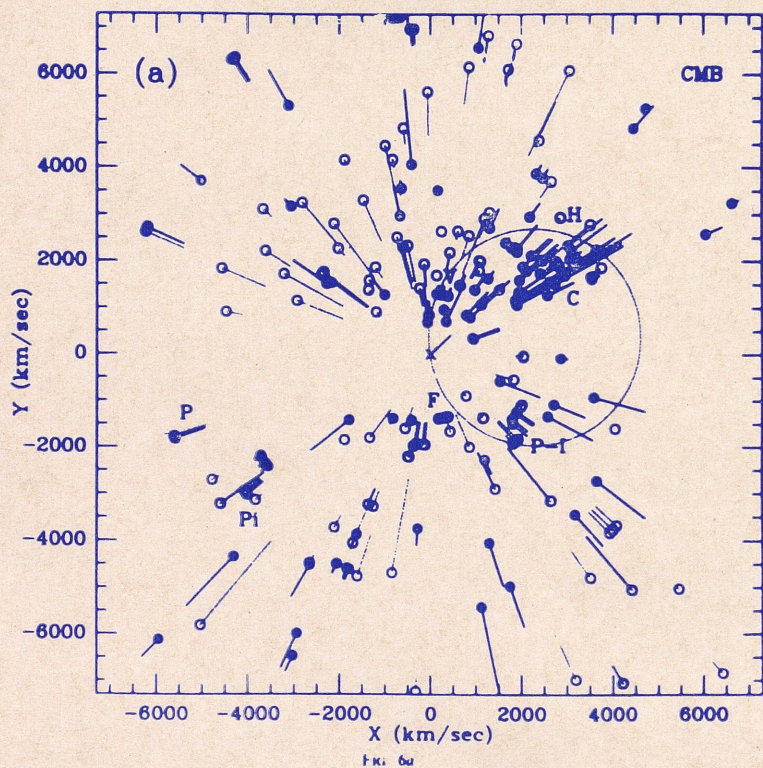


A PUBLIC LECTURE ON
COSMOLOGY AND THE GREAT ATTRACTOR

by

PROF. ROBERTO TERLEVICH



PHYSICAL RESEARCH LABORATORY

PHYSICAL RESEARCH LABORATORY AHMEDABAD

You are cordially invited to attend

a Popular Lecture

by

Professor ROBERTO TERLEVICH

COSMOLOGY AND THE GREAT ATTRACTOR

Date : 3 January, 1990

Place : Senate Hall, Gujarat University

Time : 1800 hrs.

Figure

Diagram Showing Peculiar motions of the galaxies out to several hundred million light years Milky way is at the centre and its motion is 600 Km/sec Thick and thin line show motions respectively away and towards the earth. Galaxies inside the circle are moving away with a large velocity Interpretation is that there is an enormous mass—THE GREAT ATTRACTOR—located at the right edge of the Circle.

PROF. ROBERTO TERLEVICH



Professor Roberto Terlevich is the Deputy Head of the Astronomy Support and Research Division, and Head of Extragalactic Group at the Royal Greenwich Observatory in England. He has been at RGO since 1983. He obtained his Ph.D. from the Institute of Astronomy of the University of Cambridge, England and his masters degree in Astronomy from La Plata University, Buenos Aires, Argentina.

His post-doctoral work includes the study of intrinsic properties of old elliptical galaxies and of extremely young blue dwarf galaxies. His research interest at that time was related to the use of these galaxies as distance estimators. His subsequent work at RGO covered a wide variety of topics which includes non-uniformities in the Hubble Flow—the Great Attractor, Star Formation and Active Galactic Nuclei, Formation and Evolution of Galaxies; and has very important contributions to these topics to his credit.

Professor Terlevich is a member and the Fellow of the Royal Astronomical Society and Fellow of the Cambridge Philosophical Society.

Professor Terlevich is currently visiting the Physical Research Laboratory as the fourteenth Vikram Ambalal Sarabhai Professor. The VAS Professorship has been instituted at the Physical Research Laboratory through the endowment funds provided by the Sarabhai Foundation and the Karmakshetra Charity Trust No. 2 and funds contributed by Sheth Shri Kasturbhai Lalbhai.

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COSMOLOGY AND THE GREAT ATTRACTOR

The origin and fate of the universe are imprinted in the motions of the galaxies. In the 1930's soon after the realization that our galaxy is only one of hundred of thousands of millions, it was discovered that all distant galaxies are receding in all directions. It became evident that the Universe is expanding with galaxies being carried away by the enlarging net of space time.

By the 1970's, it was generally accepted that the expansion of the Universe had an important implication: the observed expansion was initiated some 15,000 million years ago on an explosive creation event, the BIG BANG.

These ideas had a beautiful confirmation with the discovery of the Cosmic Microwave Background Radiation, released some 20 million years after the BIG BANG when the plasma that filled the Universe cooled and recombined to form Hydrogen and Helium, and the Universe become transparent.

More recently it has become clear that galaxies are not at rest with respect to the expanding space time net. They show "peculiar" motions induced by the presence of huge mass concentrations of unimaginable large scales, reflecting still poorly understood conditions in the early universe. The study of the motions may also answer about the other end of time. Will the expansion of the Universe go on for ever or will the force of gravity stop or even reverse it causing a recollapse or BIG CRASH?

It is a great pleasure for me to introduce to this audience the distinguished Speaker for this evening's talk Prof. Roberto Terlevich and his wife Dr. Elena Terlevich - also an astronomer.

Prof. Roberto Terlevich has distinguished himself by his original & important contributions to the field of Extra-galactic research. He is at present Deputy head of the Astronomy support and Research Group and Head of the Extra-galactic Group at the Royal Greenwich Observatory, U.K. He is fellow of the Royal Astronomical Society and also a fellow of the Cambridge Philosophical Society.

Prof. Terlevich has many important contributions to his credit in the field of astronomy; especially in the field of Phenomena related to the Nuclear Activity in galaxies like Active Galactic Nuclei, Seyferts, QSO's and starburst galaxies.

Prof. Terlevich is currently visiting Physical Research Laboratory as a Vikram Ambalal Sarabhai Professor. This professorship has been instituted at the Physical Research Laboratory through the generous funds provided by Sarabhai foundation, Karmakshetra Trust-2 and funds contributed by Sheth Shri Kasturbhai Lalbhai.

In this evening's talk, Prof. Terlevich will tell us about non-uniformities in the Hubble flow of galaxies and its implications on the beginning of the universe.

Before that let me have a pleasant task of offering Bouquet to Prof. Terlevich .. and Dr. Elena Terlevich.

POPULAR LECTURE BY PROF. ROBERTO TERLEVICH

Jan.03, 1990

INTRODUCTORY TALK BY PROF. R.K. Varma

Distinguished guests, colleagues and friends,

It gives me a very great pleasure to welcome you all to this evening lecture by Prof. Roberto Terlevich on "Cosmology and the Great Attractor". Prof. Terlevich, as some of you may know, is visiting PRL as a Vikram Sarabhai Professor and has been here with us since Dec.14, 1989. *He is accompanied by Mrs Elena Terlevich who is also an Astronomer.*

Professor Terlevich is a member and the Fellow of the Royal Astronomical Society and Fellow of the Cambridge Philosophical Society. *Prof T... is at present the*

Prof. Terlevich is the fourteenth in a succession of highly distinguished Vikram Professors who have visited PRL before him. This professorship has been instituted at the Physical Research Laboratory through the endowment funds provided by the Sarabhai Foundation and the Karmakshetra Charity Trust No.2 and the funds contributed by Sheth Shri Kasturbhai Lalbhai. These endowment funds have enabled PRL to invite distinguished scientists to PRL, so that our scientists, young and not so young can have the benefit of the transfer and exchange of knowledge through interaction with them. PRL is truly grateful to all the trustees for their gifts of these endowment funds.

The science of astronomy today is at the very frontiers of knowledge. When we look ^{up} ~~at the~~ sky at night, we see the beautiful star-studded sky, but at the same time, there are objects which our naked eyes cannot see; objects which are millions and millions of light years away, but which tell a story about the evolution of the Universe as a whole. Using more and more powerful telescopes, astronomers have been constantly probing the secrets of the evolution of the nature by studying objects which though look very very faint when observed with a naked eye, contain in them highly energetic processes which are mind boggling indeed.

Prof. Terlevich has been studying a class of such objects which are referred to as 'active galactic nuclei'. His post-doctoral work includes the study of intrinsic properties of old elliptical galaxies and of extremely young blue dwarf galaxies. His research interest at that time was related to the use of these galaxies as distance estimators. His subsequent work at Royal Greenwich Observatory covered a wide variety of topics which includes non-uniformities in the Hubble Flow--the Great Attractor, Star Formation and Active Galactic Nuclei, Formation and Evolution of Galaxies; and has very important contributions to these topics to his credit.

Today we are going to learn about the science of COSMOLOGY that tells us about the evolution of the Universe

and about an object which is pulling us all including the solar system that we are in, the galaxy in which the solar system is and the entire cluster of galaxies of which our galaxy is only a member.

Prof. Terlevich, as you will soon discover, is a most lucid and exciting speaker. Before I invite Prof. Terlevich to give his talk, I should like to spend a few minutes to explain the meaning and significance of the Vikram Sarabhai Professorship for those who are not already aware of it. Dr. Vikram Sarabhai, the Founder of the Physical Research Laboratory, was not just a scientist, but a builder of institutions. Besides PRL, some other institutions in Ahmedabad, such as the Ahmedabad Textile Industry's Research Association (ATIRA) and the Indian Institute of Management (IIM), owe their existence to him. PRL was, of course, the first institution that he created and being devoted to his field of scientific interest; it was, we believe, closest to his heart. Clearly, if an institution like PRL has to exist at all, it must continue to strive to be at the top, as a centre of excellence, if it has to justify its *raison de'tre*. Then alone can one sustain the spirit which must have led Dr. Sarabhai to establish this institution. One way to help sustain this spirit is to invite world class scientists to PRL and provide our young scientists the opportunity to interact with them and be thus inspired. The Vikram Sarabhai

Professorship does enable PRL to provide such opportunities to our young scientists.

We are grateful to Prof. Terlevich that he has accepted our invitation to come here as a Vikram Sarabhai Professor and to give us all the benefit of his rich experience and expertise as an astronomer.

There is yet another aspect of the Vikram Sarabhai Professorship which is related to the talk this evening. As we all know, the institutions like PRL all over the world are sustained by public funds. And, the public has been generally quite generous in letting us do our work without asking too much about its relevance to their day-to-day life. We believe that the public deserves atleast to share the excitement that we, as scientists, experience in our work. And, we believe that they deserve the best. Therefore, we have, as a matter of tradition, been requesting our Vikram Professors to deliver to the public some of the excitement of our scientific work. And they have been obliging us. This evening lecture today by our Vikram Sarabhai Professor, Prof. Roberto Terlevich, is in this continuing tradition.

As I said earlier, Prof. Terlevich is a most exciting speaker and we look forward to a most delightful lecture this evening.

It gives me a great pleasure to invite you, Prof. Terlevich, to please give your talk on "COSMOLOGY AND THE GREAT ATTRACTOR".

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